Attachment F
Transportation Area Restoration Plan

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Attachment F Transportation Area Restoration Plan

Objectives

Donlin Gold, LLC (Donlin Gold) has developed a Restoration Plan (Plan) to address wetlands lost by Transportation Area (TA) facility development from the Donlin Gold Project (Project). The Plan provides restoration of wetlands in impacted watersheds with in-kind restoration. The TA is in the Crooked Creek, Veahna Creek-Kuskokwim River, and Headwaters Iditarod River HUC-10 watersheds. The actions are designed to exceed reclamation requirements imposed by the State of Alaska upon material site closure in these watersheds.

The material sites selected for restoration in the TA are all located on State Land. Donlin Gold cannot secure long term legal use exclusions and preservation on State Land. The Alaska Department of Natural Resources (ADNR) does not require the establishment of wetlands in material site reclamation plans (ADNR 2014). However, ADNR encourages restoring sites to ponds with littoral edges to enhance fish habitat associated with material sites. In its reclamation site plans, Donlin Gold proposes to restore wetland areas, where feasible. Donlin Gold is conducting this work as minimization and not requesting compensatory mitigation credits for the material site wetland restoration, and this no financial or preservation instruments or performance standards will be filed with United States Army Corps of Engineers (USACE).

Site Selection Criteria

Material site candidates were identified as those most likely to provide wetland restoration opportunities based on groundwater hydrology (water table), favorable slope position, and the final shape (concave) after material removal. Each proposed material site in the TA was considered for restoration at closure. Not all can be restored because of location and the ability to remove fill. As shown in Table 1, the material sites selected for wetland restoration will restore 34.7 acres of wetlands.

Table 1 TA Material Site Wetland Impact Restoration Sites

TA Facility	HUC-10	Wetland Acres Impacted	Wetland Acres Restored
Material Site-10	Crooked Creek	25.3	25.3
Material Site-12	Crooked Creek	1.5	1.5
Material Site-16	Veahna Creek-Kuskokwim River	7.9	7.9
Total		**34.7**	**34.7**

Figure 1 through Figure 3 are maps and site photos of the three selected material sites.

Figure 1 TA Material Site-10 Map and Site Photos

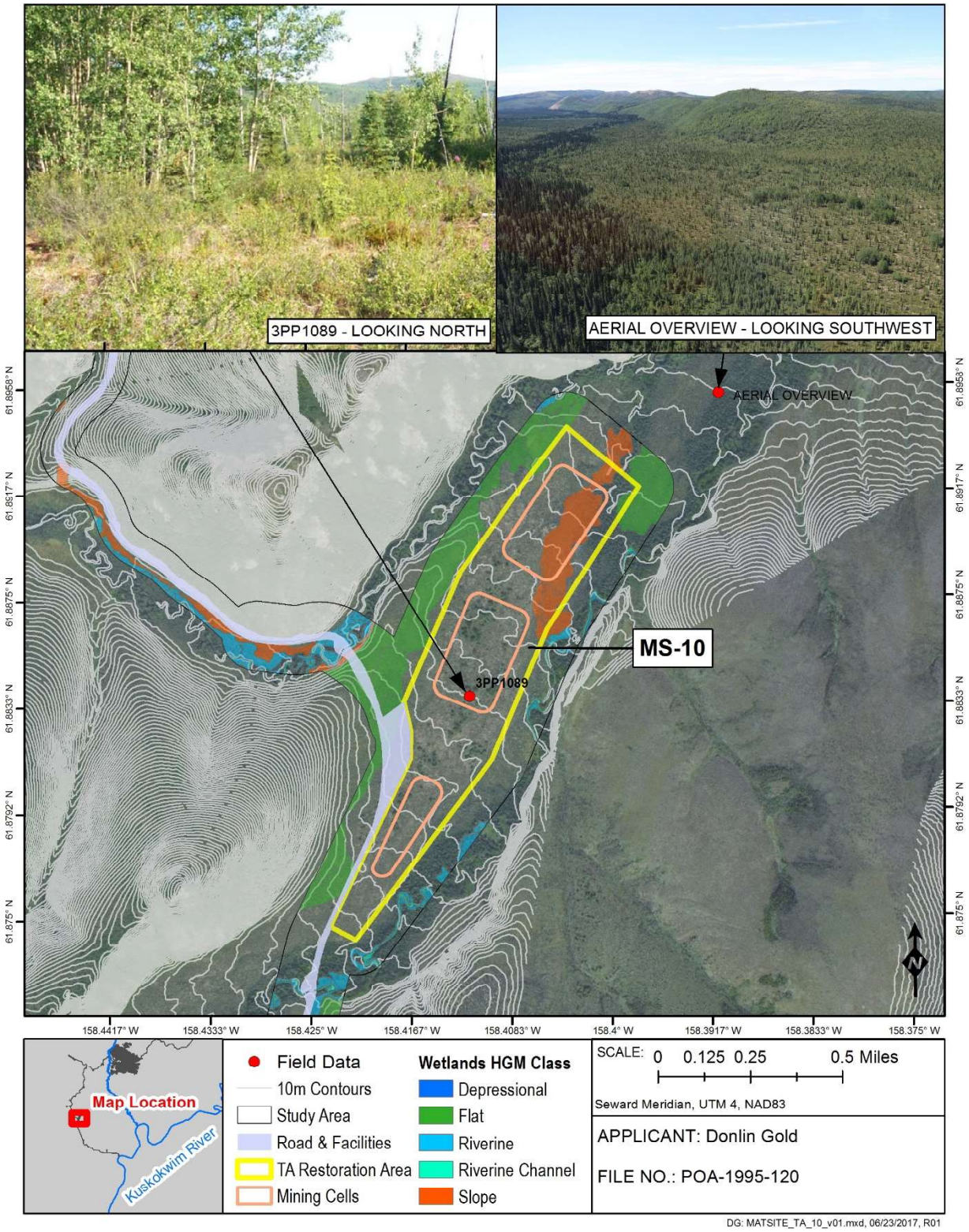


Figure 2 TA Material Site-12 Map and Site Photos

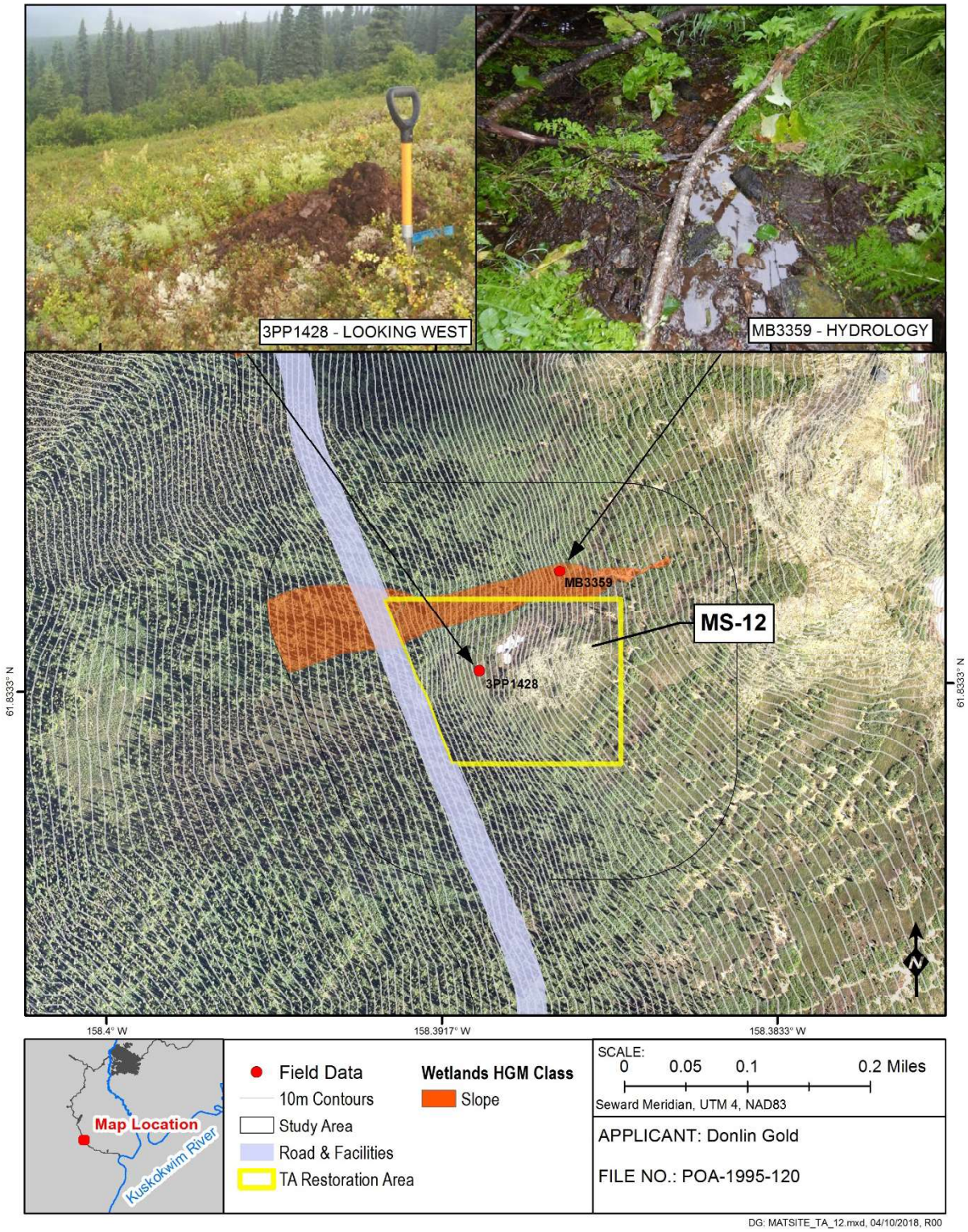
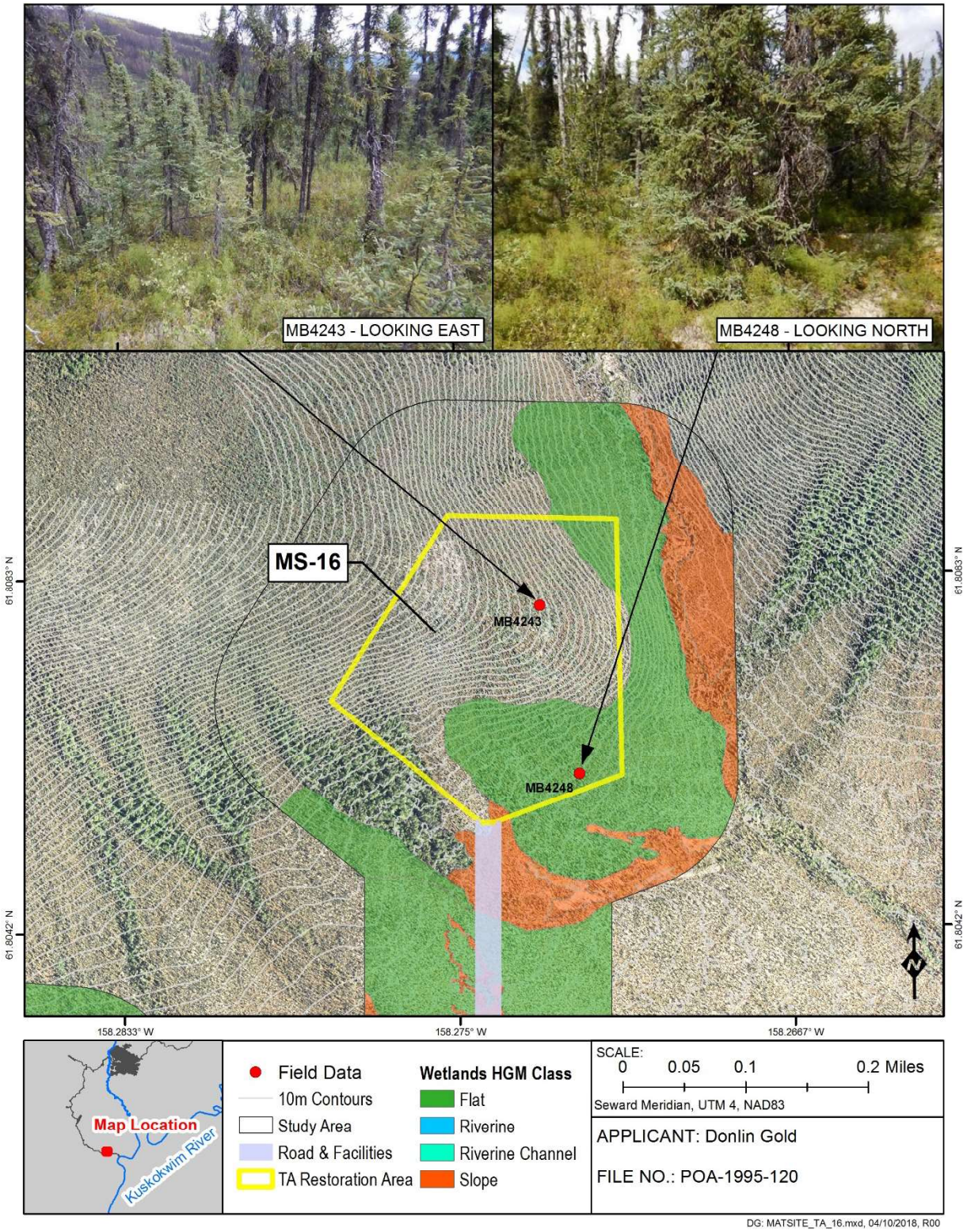


Figure 3 TA Material Site-16 Map and Site Photos



Material Site-10

Material Site-10, in the Crooked Creek HUC-10, is on a terrace between the confluence of the North and South forks of Getmuna Creek. The site is 208.3 acres. Wetlands associated with an abandoned channel of the South Fork of Getmuna Creek are at the northeast end of the site and total 25.3 acres (Figure 1). Three material site areas (cells) will be excavated, totaling 75.9 acres. Each excavation is projected to intersect the water table; the depth of water in each cell will vary along the gradient of the land surface, from less than three feet to greater than 17 feet.

Anadromous and resident fish populations are documented in both forks of Getmuna Creek indicating a diversity of species using the reaches above and below the proposed material site for spawning, rearing, and migration. Coho (*Oncorhynchus kisutch)*, chum (*Oncorhynchus keta),* and Chinook (*Oncorhynchus tshawytscha)* salmon are documented throughout Getmuna Creek downstream from the confluence of the North and South forks; however, only coho salmon are documented upstream from the confluence, adjacent to the material site. Coho salmon are likely to be present throughout the year. Dolly Varden (*Salvelinus malma)*, arctic grayling (*Thymallus arcticus),* and slimy sculpin (*Cottus cognatus)* are documented or expected to exist throughout the Getmuna Creek drainage and are also likely present throughout the year (USACE 2015).

Material Site-12

Material Site-12, in the Crooked Creek HUC-10, is on a hillside above a tributary to Getmuna Creek. Aquatic life is the same as described for the Material Site-10 site. The northern edge of the material site is a wetland swale, with at least two seeps at the head of the wetlands. The swale contains slope hydrogeomorphic (HGM) wetlands that are seasonally flooded from an intermittent headwater stream. The site is 14.2 acres, including 1.5 acres of wetlands within the swale (Figure 2).

Material Site-16

Material Site-16, in the Veahna Creek-Kuskokwim River HUC-10, is on a hillside and footslope above a tributary to Jungjuk Creek. Coho salmon, Dolly Varden, arctic grayling, round whitefish *(Prosopium cylindraceum)* and slimy sculpin have been recorded in Jungjuk Creek. The site comprises 27.7 acres and contains 7.9 acres of flat and slope HGM wetlands (Figure 3). Excavation in wetlands in this material site is projected to intersect the water table.

Vegetation

Low shrub tundra (LST), open black spruce forest (OBSF) (Photo 1, all photos Michael Baker 2016) and black spruce woodland (BSW) (Photo 2) are the most prevalent wetland vegetation types in the TA material sites. Other wetland vegetation types present in the TA sites include closed alder shrub (CAS), woodland mixed forest (WMF), and open white spruce forest (OWSF). Vegetation types are described in the 2016 Preliminary Jurisdictional Determination (PJD) (Michael Baker 2016).

Photo 1 Open Black Spruce Forest Vegetation Type

Photo 2 Black Spruce Woodland Vegetation Type

Following excavation, the material sites will be restored as permanently flooded to semi-permanently flooded waterbodies with wetland margins composed primarily of emergent vegetation with a vegetation classification of wet herbaceous (WH) (Photo 3). Excavation of material will create concave features that will hold water, thus creating the waterbodies and associated sedge/grass marshes adjacent to them.

In the Yukon-Kuskokwim Highlands Major Land Resources Area (MLRA) (Crooked Creek and Veahna Creek-Kuskokwim River HUC-10s), WH plots typically contain leafy tussock sedge *(Carex aquatilis*),

northwest territory sedge *(Carex utriculata),* bluejoint *(Calamagrostis canadensis*), and purple marshlocks *(Comarum palustre*) as dominant plants (Photo 3) (Michael Baker 2016).

Photo 3 Wet Herbaceous Vegetation, Crooked Creek HUC-10

Wetlands

The wetland impact restoration areas include HUC-10 watersheds in the Yukon-Kuskokwim Highlands MLRA. The material sites will impact a variety of wetland types based on HGM and Cowardin Classifications. Table 2 shows field data collected at the restoration sites. Table 3 lists the wetland acres, by HGM and Cowardin Groups impacted by each TA site.

Table 2 Field Data in TA Restoration Sites; HGM and Cowardin Classifications and Hydrology Notes

Plot Number	HGM	Cowardin Classification	TA Restoration Area	Hydrology Notes
3PP1804	Flat	PSS4B	Material Site 10	Saturation at 8", Water table at 20"
MB0253	Flat	PFO4/SS1B	Material Site 10	Surface water at 0", Water table at 15", Saturation at 10"
MB3358	Slope	PSS1C	Material Site 12	Spring seeps with surface water
MB3359	Slope	PSS1C	Material Site 12	Spring seeps with surface water
MB4248	Flat	PSS1/FO4B	Material Site 16	Saturation present
MB4250	Slope	PSS1/FO4B	Material Site 16	Water table at 10"

Table 3 Baseline Wetland Types Impacted, by TA Site

Facility	HGM Class	Cowardin Groups	Acres	Total Acres
Material Site-10	Flat	Coniferous Forests	1.4	
		Scrub Shrub	1.3	
		Total		**2.7**
	Slope	Coniferous Forests	15.5	
		Scrub Shrub	7.2	
		Total		**22.7**
Material Site-12	Slope	Coniferous Forests	0.1	
		Scrub Shrub	1.4	
		Total		**1.5**
Material Site-16	Flat	Scrub Shrub	7.7	
	Slope	Scrub Shrub	0.2	
		Total		**7.9**
		Grand Total		**34.7**

Sites After Restoration

Based on the information presented in Table 2 (Michael Baker 2016), it is expected wetland hydrology will be re-established at the material sites after site closure and restoration.

Material Site-10

The Plan is to create ponds and littoral zone habitat and connect them to Getmuna Creek by engineered channels. Littoral zones (emergent wetlands along the shoreline) are productive areas of the ponds, allowing for nutrient retention and cycling of elements, shoreline and sediment stabilization, aquatic vegetation growth, refuge for juvenile fish, and organic material inputs (Peters and Lodge 2009). Side slopes of the cells will be graded to create littoral zone habitat, with shallow sedge marshes expected along the edge of the ponds. In total, 25.3 acres of wetlands will be restored to include ponds, emergent wetlands, and connecting channels for fish. Several of the created ponds are expected to provide rearing and overwintering habitat for fish.

Material Site-12

The final material site pit design will leave a concave depression in the remaining upland hillside. The surface contour of the swale will be re-graded to convey surface water downhill. The material site depression next to the swale will be excavated to proper depth so water will funnel into the depression to create a new wetland. With hydrology in place, the overburden can be returned to the wet depression and an emergent wetland is expected. However, this restoration Plan is only for the re-establishment of the original wetland swale.

Material Site-16

Upon restoration, a concave feature will capture and slowly release water downhill. After the material site is reclaimed, the 7.9 acres of wetlands will be restored as slope HGM.

Restored Wetlands

The aquatic resource losses from the Project have been described using HGM and the Cowardin Classification system by acres for wetlands and linear feet for stream loss. The same methods are used to identify aquatic resources restored by this Plan.

Final acres of HGM and Cowardin Groups for TA restoration areas are shown in Table 4. The dominant Cowardin and HGM classification when completed is slope palustrine forested/scrub shrub.

Table 4 HGM Classifications and Cowardin Groups of TA Restoration (Acres)

HGM Classification	Cowardin Group	Acres
Depressional	Palustrine Emergent	13.0
Flat	Palustrine Scrub Shrub	10.4
Slope	Palustrine Scrub Shrub	11.3
Total		**34.7**

Restoration Plan

Restoration timing of material sites in the TA will vary based on the duration of material removal from the sources and the sequence of the construction. As material is no longer required from these sites, they will be restored as soon as practicable. Material from Material Site-12 and Material Site-16 will be used for construction of the Jungjuk Road. After the road is constructed and fill material needs are met, these sites will be restored. Material Site-10 will provide material for road construction and aggregate for concrete for mine operations. Restoration will not occur at this site until the first cell can be restored or until mine closure.

Work at the material sites will typically be completed in four phases: construction, operation, restoration, and monitoring (Table 5).

Table 5 TA Material Site Work Schedule

Years	Phases and Objectives
0 to 1	**Construction:** Design, plan, survey, construct the access road and facilities; grade, remove and stockpile organics and topsoil.
0 to MSC (Material Site Closure)	**Operation:** Maintain water and erosion control structures; excavate, stockpile, and use the material; complete interim reclamation; monitor.
Within Year 1 after MSC	**Restoration dirt work:** Re-grade and re-contour excavation; remove and reclaim roads, facilities, stockpiles, ditches, berms; spread topsoil and organics; create final water and erosion control structures.
Within Year 2 after MSC	**Restoration vegetation:** Develop seed bed plans; preparation of bed, fertilizing, mulch additions, planting, and seeding; organic control for desired vegetation mix.
2 Years after MSC	**Monitoring:** Ensure site meets final reclamation criteria.

Throughout all phases, water and erosion control structures and measures will be maintained to protect water quality in adjacent wetlands, streams, and rivers. The following is a synopsis of each activity:

- During construction of required access roads to the material site and construction of facilities, organics and topsoil will be removed and stockpiled in the mining areas. Organics and topsoil will be stockpiled on site to be used in final reclamation and restoration of each site. Facility work includes installing fueling locations, constructing storm water controls, and placing crushing or screening plants in the material site pits as required.
- Cells will be excavated and sand and gravel will be stockpiled on-site before being transported to work areas. Water and erosion control structures and measures will be installed and maintained during this phase to protect water quality in adjacent streams and rivers. Excavation of the material sites is projected to intersect the water table. The cells are anticipated to be excavated below ground water on site to minimize pumping impacts on adjacent wetlands and streams. Surface drainage from operations will be controlled to protect adjacent streams. Interim reclamation and stabilization will be conducted during operations where mining has been completed.
- Following cell excavation, side slopes will be flattened to promote establishment of littoral zones and herbaceous emergent vegetation around the newly formed ponds. The pits will be designed to maintain surface hydrology and contoured to maximize vegetated wetlands. Cell edges will be completed in irregular shapes to promote edge habitat. The stockpiled topsoil or surface organic material will be returned to promote vegetation regrowth. Additional segregated organics removed from adjacent project areas may be placed when additional carbon is desirable. If necessary, fertilizer will be added to promote re-vegetation. Seeding and planting will be conducted using guidelines from A Re-Vegetation Manual for Alaska (Wright 2008) and the Interior Alaska Re-vegetation and Erosion Control Guide (Czapla and Wright 2012). Seed mixes will be cultivated from both the seedbank in stockpiled wetland topsoil (growth media) and from commercially available native wetland seed mixes. Species present in currently available wetland and upland seed mixes are shown in Table 6. Egan American Sloughgrass, a primary component of the seed mix, has been shown to be successful for revegetation in wetlands in Interior Alaska (Czapla and Wright 2012).

Table 6 Wetland and Upland Seed Mixes

Species Name	Latin Name	National Wetlands Inventory (NWI) Indicator Status	Upland Mix, Percent	Wetland Mix, Percent
Arctic Red Fescue	*Festuca rubra*	Facultative	50	20
Tundra Glaucous Bluegrass	*Poa glauca*	Not Listed	20	0
Gruening Alpine Bluegrass	*Poa alpina*	Facultative Upland	20	0
Nortran Tufted Hairgrass	*Deschampsia caespitosa*	Facultative	10	40
Egan American Sloughgrass	*Beckmannia syzigachne*	Obligate	0	40

- Re-vegetation – Re-establishment of plant cover by means of seeding, or natural re-invasion. If necessary, fertilizer will be added to promote re-vegetation. Uplands will be re-vegetated to control sediment and nutrient loading to wetlands. Detailed re-vegetation techniques are included in the Interior Alaska Re-vegetation and Erosion Control Guide (Czapla and Wright 2012). Depressional, palustrine emergent wetlands will be the primary established wetland type in the former material sites. Over time, native seeds will germinate from the growth media seed bank or from natural colonization from adjacent vegetation; black spruce and shrubs may return to the restoration areas over time as palustrine scrub shrub and forested wetlands.

Reclamation Criteria

Vegetation and hydrology reclamation criteria are modified from General Permit (GP) POA-2014-55: Mechanical Placer Mining Activities within the State of Alaska (USACE 2014). No soil reclamation criteria are proposed; development of hydric soils typically lags the other two parameters following creation or restoration of wetlands.

Vegetation Criteria

Vegetation criteria will ensure restored and re-vegetated wetland areas and upland berms are following a trajectory to be stable and functioning biologically. Table 7 contains the Plan vegetation reclamation criteria and timing.

Table 7 TA Vegetation Reclamation Criteria and Timing

Restoration Area	Reclamation Criteria
Upland Berms	Achieve 30% live plant cover of the upland berm by the end of three (3) growing seasons.
	Achieve 70% live plant cover of the upland berm by the end of five (5) growing seasons.
	Cover of invasive species is no more than 10%.
Wetlands	Achieve 30% live plant cover of constructed wetland areas by the end of three (3) growing seasons.
	Achieve 70% live plant cover of constructed wetland areas with vegetation community meeting the Dominance Test or Prevalence Index for hydrophytic vegetation by the end of five (5) growing seasons.
	Cover of invasive species is no more than 10%.

Wetland Hydrology Criteria

Wetland hydrology indicators as described in the Alaska Regional Supplement (USACE 2007) will be used as evidence of sufficient hydrology to support wetland and pond formation and function. However, only a subset of those indicators will be used during the monitoring period. This subset includes three of the four groups of indicators presented in the supplement (Table 8). The fourth group, Group D – Evidence from Other Site Conditions or Data, will not be used to monitor hydrologic conditions within the restored wetland areas because landscape variables for the group were derived for natural settings and are not applicable for use in recently constructed wetlands. Additionally, the indicator Sparsely Vegetated Concave Surface will be excluded because it is counter to the vegetation reclamation criteria.

One primary indicator from any group is sufficient to conclude that wetland hydrology is present. Secondary indicators have been excluded from the reclamation criteria. Monitoring for hydrologic indicators will occur within 10-meter-squared (m^2) plots coinciding with the vegetation monitoring sampling.

Table 8 TA Wetland Hydrology Indicators

Group	Indicator
Group A – Observations of Surface Water or Saturated Soils	A1 – Surface Water
	A2 – High Water Table
	A3 – Saturation
Group B – Evidence of Recent Inundation	B1 – Water Marks
	B2 – Sediment Deposits
	B3 – Drift Deposits
	B4 – Algal Mat or Crust
	B5 – Iron Deposits
	B6 – Surface Soil Cracks
	B7 – Inundation Visible on Aerial Imagery
	B15 – Marl Deposits
Group C – Evidence of Current or Recent Saturation	C1 – Hydrogen Sulfide Odor
	C2 – Dry-season Water Table

Monitoring

Wetland monitoring will include periodic inspections, once a year for five years following restoration. The inspections will occur during the growing season. The purpose of the monitoring is to assess the success of the restored habitats using the reclamation criteria described above and to determine whether remedial actions are necessary to assure the reclamation criteria are met.

Monitoring of restored wetlands and ponds will consist of collecting and evaluating quantitative data on the hydrology and plant communities within the restored wetlands. Monitoring points will be established to monitor trends in plant communities. Transects at monitoring points will be run to determine vegetation cover across the restoration area.

Monitoring point locations will be monumented with Global Positioning System and physically using rebar stakes and flagging to facilitate revisit. At shrub vegetation sampling points, the percent cover of shrub species, bare ground, and open water, as well as the number of species will be recorded within a 10-m^2 plot. Herbaceous species and percent cover will be recorded within a 1-m^2 quadrat placed at random in the plot area. Hydrology will be characterized at wetland and pond sampling points. All non-native plant species and their relative cover will be recorded. Non-native plant recruitment data will be used to assess the need for active measures to remove non-native plants from restoration areas.

Monitoring reports will be produced annually and submitted to USACE December 31 of each year until the areas meet reclamation criteria.

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